

Rheumatic fever and rheumatic heart disease in developing countries

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Studies on the prevalence and other epidemiological features of rheumatic fever and rheumatic heart disease and pilot prophylactic programmes have been carried out in India for the past 12 years or more. The results of these, together with data from other developing countries, have been taken into account in discussing the problems of these diseases in the developing world. Suggestions for their control, to be modified according to local conditions, are made.

The material in this paper pertaining to India has been derived from clinical experience in Delhi since the early 1950s and from the results of several research projects carried out under the auspices of the Indian Council of Medical Research on prevalence, epidemiological features, and secondary prophylaxis over the past 12 years. While it may not be wholly correct to extrapolate the conclusions drawn from the Indian experience to other developing countries, visits to Egypt, Israel, Indonesia, Thailand, and the Philippines, where work on rheumatic heart disease is being carried out, leads me to believe that many of these conclusions and facts would apply to such countries.

HISTORICAL DATA

Prior to 1945, rheumatic fever and rheumatic heart disease were generally believed to exist only in temperate climates. In publications emanating from the United States of America and the United Kingdom in the early years of this century, rheumatic fever was stated to be widely prevalent in young people and many young women died during childbirth of congestive heart failure and pulmonary oedema. There was also a high prevalence in schoolchildren, as noted in surveys of that period.

Military physicians working in India before the Second World War commented on the rarity of rheumatic heart disease and rheumatic fever both clinically and at autopsy. Subsequently however, publications from the different states of India pointed to rheumatic heart disease as being the main cardiac problem. Further data from India have revealed no decline in the prevalence of rheumatic heart disease over the past 25-30 years. There is a high prevalence in schoolchildren and many deaths occur from severe rheumatic heart disease. In fact, the position is exactly the reverse of that in affluent countries and resembles the situation in those countries at the turn of the century. It is tempting to suppose that the prevalence of rheumatic heart disease increased in India and other developing countries after the Second World War. With rapid industrial expansion in these countries, together with urbanization and the development of slums, there is more cross-infection and favourable conditions exist for the spread of rheumatic heart disease.

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THE PRESENT POSITION IN DEVELOPING COUNTRIES

Prevalence

It is generally believed that rheumatic heart disease is widely prevalent in developing countries all over the world, but reliable statistics are difficult to obtain because of the poor facilities for registration of cause of death in many of these countries. Autopsy results are often not available and one has to combine various sources of information, such as epidemiological surveys, mortality statistics, and clinical statistics from hospitals, in order to estimate prevalence.

In the New World, rheumatic heart disease is prevalent in many parts of Latin America such as Brazil, Chile, Colombia, Costa Rica, Guatemala, Mexico, Panama, Peru, Venezuela, and the West Indies.^a In these countries, the main cardiovascular causes of death in those aged between 5 and 35 years are rheumatic fever and rheumatic heart disease. Most of the deaths occur in those aged less than 15 years, whereas in affluent countries death from the same cause occurs much later.

There is also a high prevalence in Mediterranean countries such as Algeria, Cyprus, and Egypt. The prevalence among schoolchildren in Algeria was 15 per 1000 in one survey. In Cyprus over the past 10 years there have been 40–65 new cases per year in children admitted to the Nicosia General Hospital serving a population of 150 000 inhabitants. In Egypt, in a field study on schoolchildren 6–12 years of age, there was a prevalence of rheumatic heart disease of 9.8 per 1000 and a similar prevalence has been reported among schoolchildren in Morocco, where up to 4.5% of all hospital admissions were for rheumatic fever. In the Sudan, 1 per 1000 inhabitants is admitted to hospital with rheumatic fever out of a population of 14 million. Other parts of Africa, such as Ethiopia, Nigeria, and Senegal, have a high prevalence of rheumatic heart disease. At Abadan, Iran, in 1971, an incidence of 1 per 1000 was recorded among a population of 70 000. In an underprivileged area of Teheran, a prevalence of 22 per 1000 was noted in schoolchildren, and hospital statistics showed that 30–60% of all patients admitted with cardiac conditions were suffering from rheumatic heart disease. A prevalence of 17 per 1000 has been reported among children in Pakistan.

There is a high prevalence among schoolchildren and total hospital admissions in Burma, Hong Kong, Indonesia, Mongolia, and Sri Lanka. In Thailand, a high prevalence has been reported in Bangkok and even in the rural areas. In Singapore, the situation has changed over the last few years and the disease has been completely controlled. In the Philippines, however, there is still a high prevalence both of rheumatic heart disease and of resulting congestive heart failure.

Prevalence in India

In India, the prevalence estimated from all sources of data is shown in Table 1. The wide differences in statistical data should be pointed out. These may be due in part to a lack of uniform criteria in reporting and to variability in the number of autopsy reports available. The prevalence among schoolchildren is considerably different from that in more affluent countries, where it is less than 1 per 1000.

^a STRASSER, T. & ROTTA, J. *WHO Chronicle*, 27: 49-54 (1973).

Table 1. Recent data from various sources on the occurrence of rheumatic fever and rheumatic heart disease in India.

Source	Rheumatic heart disease	Rheumatic fever
Registrar General (per 100 000)	3.1–6.7	0.6–0.7
Employees' insurance data (per 1000)	1.3	10.9
Epidemiological studies		
Adult population (per 100 000)	123–200	
Schoolchildren (per 1000)	6–11	
Hospital admissions (per 100 heart cases)	33–50	
Autopsies (per 100 cases)	2.3–29.3	

Table 2. Differences in the occurrence and patterns of rheumatic fever and rheumatic heart disease in developed and developing countries

	Developed countries	Developing countries
Prevalence in general population (per 10 000)	12–15 (rheumatic fever)	100–200 (rheumatic heart disease)
Prevalence in schoolchildren (per 1000)	< 1	11–22
Percentage of total heart cases in hospital	< 25	33–55
Age at which disease is first diagnosed (years)	6–15 (acute attacks)	10–15 (chronic valvular disease)
Social groups affected	underprivileged	widespread throughout whole population
Pattern of rheumatic fever	relatively mild acute attacks; relatively mild residual heart disease	severe carditis with congestive heart failure; severe chronic valvular disease

The differences in the prevalence and epidemiological features of rheumatic fever and rheumatic heart disease between developed and developing countries are summarized in Table 2.

SPECIAL FEATURES OF RHEUMATIC FEVER IN DEVELOPING COUNTRIES

Age, sex, and socioeconomic groups

The age and sex distribution tends to differ among the various studies in the developing countries. In a study carried out in five states in India, the sex distribution was very variable: in Delhi, males were mainly affected and in the state of Kerala females, whereas in central India both sexes were equally affected. The average age at which patients show symptoms is higher in India than elsewhere, the 10–14-year age group being more affected than the 6–9-year age group in the school surveys and the prophylaxis programmes. This may be due to the disease not being detected or treated at an early age or to the fact that patients do not show symptoms until they are older. The socioeconomic groups affected were of the lowest social class, with incomes well below 250 rupees per month.

Rheumatic manifestations

It has been thought that rheumatic fever in the tropics is manifested somewhat differently from that in temperate countries. However, studies on Indian children have shown definite rheumatic manifestations such as arthritis and chorea no different from those reported elsewhere.^a Even in developed countries, as many as 40% of attacks of rheumatic fever are associated only with carditis, and occur in patients who do not develop other major manifestations of rheumatic fever.^b In addition, it is believed that those who have very severe attacks die within 5–10 years and those who suffer with heart disease in later life have had a milder form of rheumatic fever.

Applicability of the Jones criteria

It has been said that the Jones criteria are not strictly applicable in the developing countries. This may not be correct, as in a poverty-stricken population attention is paid only to very severe illness and minor symptoms tend to be ignored, either because of lack of education or, more important, owing to a lack of medical facilities. This applies, of course, to other diseases as well. When a history is taken retrospectively from patients with frank rheumatic heart disease, the data are often vague and ill defined. In a study carried out from 1966 to 1972,^c the Jones criteria were applicable in about 54% of 994 patients. Of these, only 14% had two major criteria, the remaining 86% having one major and two minor criteria. The minor criteria used were laboratory tests for streptococcal infection and raised erythrocyte sedimentation rate. Without laboratory aids, therefore, the diagnosis of active carditis could not have been made.

Polyarthralgia

This symptom is the most common rheumatic manifestation. A large number of persons in the poor income groups complain of it but do not show a rise in antistreptolysin-O titre or erythrocyte sedimentation rate. In a collaborative study in India involving five cities, it was possible to follow up a large number of children with polyarthralgia for a period of 3 years or more. Polyarthralgia tended to occur more often in patients with rheumatic heart disease than in those with innocent murmurs, the difference being significant at the 1% level. However, polyarthralgia by itself does not appear to be a significant symptom of rheumatic heart disease.

“Malignant” rheumatic fever

Severe disease with multivalvular lesions, gross cardiac enlargement, and congestive failure can occur in young patients, and such children show more symptoms of congestive failure than of rheumatic disease. This severe disease may be due in large measure to a lack of rest during the initial carditis and this again may be attributed to ignorance, poverty, and a lack of medical facilities.

^a SANYAL, S. K. ET AL. *Circulation*, 49: 7-12 (1974).

^b STOLLERMAN, G. H. In: Shaper, A. G. et al., ed. *Cardiovascular disease in the tropics*. London, British Medical Association, 1974, pp. 7-19.

^c PADMAVATI, S. ET AL. *Singapore medical journal*, 14: 457 (1973).

Juvenile mitral stenosis

The youngest patient with rheumatic mitral stenosis seen by the author was 5 years old and the youngest person with rheumatic fever was a child of 3 years. In developing countries, mitral stenosis is severe enough to require commissurotomy before the age of 20 or even 15 years. Out of 1408 patients with rheumatic heart disease seen at the Govind Ballabh Pant Hospital, New Delhi, between 1967 and 1973, 713 (51%) had mitral stenosis. Out of 140 patients with mitral stenosis below the age of 20 who underwent surgery, 4 (2.8%) were under 10 years of age, 55 (39.4%) were between 10 and 15 years old and 81 (57.8%) were between 15 and 20 years old. Similar figures have been reported from other centres in India and from other developing countries.^a

FAMILIAL PATTERNS

Two per cent of cases in various studies in India were associated with a familial pattern of rheumatic heart disease. Sometimes as many as 5 or 6 members of a family were affected.

MICROBIOLOGICAL ASPECTS

Data have accumulated in India on the typing of streptococci associated with rheumatic heart disease, mainly through the work of the World Health Organization/Indian Council of Medical Research Streptococcal Reference Laboratory in New Delhi.

The streptococcal isolation rate from 9188 throat cultures from patients with rheumatic heart disease during a 4-year follow up from 1971 to 1975 was 16%. Group A streptococcal infection accounted for 24% of these. The T type pattern 1/3/13/B3264 of group A was present in 23% of cases, the U type pattern 2/6/4/28 in 26%, the W type pattern 5/11/12/27/44 in 20%, the X type pattern 14/8/25/IMP in 25%, and the Y type pattern in 6%. Data of this type, now being acquired from many parts of India, should be useful in the future.

CONTROL OF RHEUMATIC HEART DISEASE

Rheumatic heart disease is only one of the many problems faced by all the developing countries. Although it is an eminently preventable disease and guidelines for its control have been laid down by the World Health Organization and other bodies, because of the health priorities in many of these countries its control has been largely neglected. The cost of treating repeatedly a large number of patients in already overcrowded hospitals and the high cost of and poor facilities for cardiac surgery, including valve replacement and commissurotomy, provide strong arguments for prevention.

Primary prevention, although ideal, is difficult in large populations and, except in small city states such as Singapore, cannot be achieved. Secondary prophylaxis remains the most

^a CHERIAN, G. ET AL. *British heart journal*, 6: 157 (1964).

practical solution. The prophylaxis programme in India from 1968 to 1974 showed the following features:

1. Patients entered the study following hospital discharge, as a result of school health programmes, or by being referred by general practitioners. On entry, 75% were in a late stage of the disease (Group III of the American Heart Association classification) and in such cases prophylaxis was hardly worth while.

2. A high dropout rate of 30%.

3. A death rate of about 11%.

4. A streptococcal infection rate of 0.14 per patient year and a rheumatic recurrence rate of 0.02 per patient year. The former is higher than in studies carried out in the USA.

Because of the high infection rate in both Egypt and India, it has been suggested that penicillin should be given once every 3 rather than 4 weeks to maintain adequate blood levels during reinfection, and this has certainly resulted in a fall in the infection rate. Secondary prophylactic programmes are expensive, however, and difficult to maintain in large populations. It has been suggested in the Indian context that such programmes should be dovetailed into existing health care delivery services such as school health and nutrition programmes. It has also been suggested that case-finding should be started at the primary school level in children between the ages of 5 and 9 years; this would require strengthening of the school health services. Another strategy being tried in India is the administration of penicillin only during peak periods of infection instead of throughout the year. In the Delhi study, the peak period of streptococcal infection was found to be between November and February. Another pilot study involves issuing a questionnaire to primary school teachers in order to pick out children with rheumatic fever and rheumatic heart disease.

As many of the developing countries are not likely to achieve a state of high economic development in the foreseeable future, such studies will be useful in selecting the most profitable and least expensive methods of controlling rheumatic heart disease in these countries.

RÉSUMÉ

Rhumatisme articulaire aigu et cardiopathies rhumatismales dans les pays en développement

Bien que la présente étude soit fondée sur les données cliniques rassemblées à Delhi et sur les résultats de projets de recherche exécutés sous l'égide du Conseil indien de la Recherche médicale au cours des douze dernières années, les travaux menés dans d'autres pays en développement — notamment l'Égypte, l'Indonésie, Israël, les Philippines et la Thaïlande — portent à croire que le tableau des cardiopathies rhumatismales y est à peu près le même. L'augmentation de la prévalence de ces affections dans lesdits pays depuis la fin de la Deuxième Guerre mondiale coïncide sans doute avec une période d'industrialisation rapide et d'urbanisation: la situation y est comparable à ce qu'elle était au début du siècle dans les pays occidentaux et n'a pas subi de grand changement depuis 25 à 30 ans. Pour en dresser un tableau général, on s'est servi des diverses sources disponibles: enquêtes

épidémiologiques, statistiques de mortalité — pour autant qu'elles existent et soient fiables — et registres des hôpitaux. En Amérique latine, le rhumatisme articulaire aigu et les cardiopathies rhumatismales sont la plus importante cause de décès par maladie cardiovasculaire dans les groupes d'âge 5–35 ans, et particulièrement au-dessous de 15 ans. La prévalence est également élevée dans les pays méditerranéens: en Algérie où ces maladies frappent 15 pour 1000 des écoliers, à Chypre avec 40–65 nouveaux cas admis annuellement dans le service pédiatrique de l'Hôpital général de Nicosie, en Egypte et au Maroc où la prévalence a été évaluée à 9,8 pour 1000 chez les écoliers. Une forte prévalence a aussi été constatée en Ethiopie, au Nigéria, au Sénégal et au Soudan. En Iran, 30 à 60 % des malades admis dans les hôpitaux pour une affection cardio-vasculaire sont atteints de cardiopathies rhumatismales, et celles-ci frappent 17 écoliers pour 1000 au Pakistan. En Asie du Sud-Est (Birmanie, Hong Kong, Indonésie, Mongolie, Sri Lanka, Thaïlande), la prévalence est non moins forte. A Singapour, les mesures prises ces dernières années ont permis de juguler efficacement les affections considérées; en revanche, la prévalence est restée élevée aux Philippines. Le tableau 1 fournit les données statistiques relatives à l'Inde: les taux de prévalence varient assez fortement en raison sans doute de l'absence de critères uniformes, mais les chiffres sont dans l'ensemble voisins de ceux cités pour d'autres pays en développement, avec 6 à 11 cas pour 1000 écoliers, alors que la proportion est inférieure à 1 pour 1000 dans les pays riches. Les différences de prévalence entre les deux types de pays sont indiquées dans le tableau 2.

Selon l'analyse des caractéristiques des affections en cause dans les pays en développement, la distribution par âge et par sexe est variable, mais ce sont les groupes sociaux les plus défavorisés qui sont le plus souvent frappés. En ce qui concerne les manifestations cliniques du rhumatisme articulaire aigu, on a constaté dans les groupes d'enfants étudiés des manifestations majeures comme l'arthrite et la chorée, mais il arrive que la cardite soit seule présente, ce qui est également souvent le cas dans les pays occidentaux. Cependant, comme les sujets les plus gravement atteints survivent rarement au-delà de 5 à 10 ans, on ne rencontre guère dans les groupes d'âge plus élevés que les manifestations mineures figurant dans les critères de Jones, lesquelles sont souvent méconnues dans les populations pauvres. Dans une étude rétrospective, les critères de Jones ne se sont révélés applicables qu'à 54 % des 994 malades examinés et se répartissaient ainsi: deux manifestations majeures chez 14 % et, pour les 86 % restants, un critère majeur et deux critères mineurs (ces derniers étant l'infection streptococcique et une vitesse de sédimentation élevée, décelées par examens de laboratoire). La polyarthralgie, très souvent invoquée sans augmentation du taux d'anti-streptolysine O, ne peut être retenue comme symptôme significatif. L'insuffisance cardiaque souvent constatée chez les enfants peut être due à une cardite initiale méconnue ou mal traitée. La sténose mitrale, séquelle de l'endocardite rhumatismale, a été diagnostiquée chez 50 % des 1408 malades reçus dans un hôpital de Delhi entre 1967 et 1973; une commissurotomie a été pratiquée sur 140 malades de moins de 20 ans appartenant principalement aux groupes d'âge 10–20 ans. Un tableau analogue se dégage des données fournies par d'autres centres en Inde et dans divers pays en développement.

Dans une étude suivie (1971–1975), le laboratoire OMS/Conseil indien de la Recherche médicale de référence pour les streptocoques, à Delhi, a isolé chez 16 % d'un groupe de 9188 malades atteints de cardiopathie rhumatismale des streptocoques à partir de prélèvements pharyngés; 24 % de ces agents se répartissaient entre différents types du groupe A. On devrait disposer à l'avenir d'un nombre croissant de données de ce genre pour différentes parties de l'Inde.

La lutte contre les cardiopathies rhumatismales a été jusqu'à présent reléguée à un rang de priorité peu élevé dans les pays en développement. La prévention — au moyen de mesures dont l'efficacité a été confirmée — devra prendre le pas sur un traitement et une chirurgie coûteux, bien qu'elle soit difficile à réaliser au niveau primaire dans de vastes populations. Quant à la prophylaxie secondaire, elle a été expérimentée en Inde de 1968 à 1974 sur un ensemble de cas — qui correspondaient malheureusement au stade III de la maladie selon la classification de l'American Heart Association — venant d'hôpitaux ou de cabinets médicaux, ou encore décelés par les services de santé scolaire. Onze pour cent des malades de ce groupe sont décédés et 30 % ont cessé le traitement. Les taux d'infection streptococcique et de rechute ont été plus élevés que dans un groupe étudié aux Etats-Unis d'Amérique. En Inde comme en Egypte, il a été jugé bon, en raison du taux élevé d'infection, de raccourcir l'intervalle entre deux injections de pénicilline à 3 semaines au lieu de 4, et cette mesure a permis de réduire le taux d'infection. Mais la prophylaxie secondaire demeure coûteuse et elle pourrait être avantageusement assurée dans le cadre des prestations fournies au titre de programmes de nutrition et par les services de santé scolaire. Ces derniers devront d'ailleurs être renforcés pour permettre le dépistage chez les enfants de 5 à 9 ans en vue d'une prévention précoce. Le choix des méthodes les moins coûteuses et les plus efficaces devra s'imposer encore longtemps dans les pays en développement et, parmi les mesures en cours d'expérimentation, on peut citer l'administration de pénicilline limitée aux périodes où l'infection streptococcique est la plus forte — soit novembre à février à Delhi. Enfin, un questionnaire a été adressé aux instituteurs dans le cadre d'une étude pilote, car cette mesure pourrait faciliter le dépistage des cas de rhumatisme articulaire aigu et de cardiopathie rhumatismale chez les enfants.
